

## **Appendix D**

### **CVOC Historical Case Analysis Plume Screening Checklist**

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The purpose of this Initiative is to evaluate the extent and behavior of chlorinated volatile organic compound (CVOC) groundwater plumes and, depending on the outcome of the data analysis, provide project managers with information to aid in decision making. Our working hypothesis is that the attributes of chlorinated solvent plumes, such as plume dimensions (length, width, thickness) and plume growth, have natural groupings. By identifying these natural groupings and data necessary for site evaluation, this document should help project managers to collect the appropriate data. This in turn should be an aid to the CVOC cleanup decision making process.

During 1997 the Initiative Data Collection Team will be collecting data on CVOC plume behavior. This screening checklist is intended to identify plumes that will be "nominated" for more in-depth data gathering. Plumes that qualify for the study must have sufficient data on fundamental factors such as advection, dispersion, sorption, and degradation.

This CVOC Plume Screening Checklist is intended to guide a case reviewer in determining if sufficient data is available to include a plume in the historical case analysis. The Plume Screening Checklist identifies key data requirements that must be available for a plume to be nominated for further evaluation. Nominated plumes will be reviewed by the Initiative Data Collection Team, who will complete a more extensive data collection checklist, and gather the data that will be entered into the historical case analysis database.

#### **D-1. Site Location, Points of Contact, and Reviewer**

This information is needed to identify the location of the plume and participant organization points of contact who performed the screening. In addition, the information is needed to identify points of contact for the responsible party and site consultant to facilitate electronic data gathering.

#### **D-2. Key Screening Questions**

These questions are placed early in the check list, so a person reviewing a given plume will not waste time on plumes that are not useful. If the answers are "yes" to these key questions, then it will be worthwhile to continue with the checklist.

#### **D-3. Explanation of Checklist Sections**

The CVOC Plume Screening Checklist is divided into ten sections. Each section is intended to provide important information need to perform the plume data collection process.

##### **1. Site Description and History**

Sites that have inadequate or no written site description or release history are excluded.

## 2. Chemicals of Concern

The major CVOCs of concern in the United States that impact groundwater are carbon tetrachloride (CT), tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (TCA), 1,1,2-tetrachloroethane, and their CVOC daughter products chloroform (CF), methylene chloride (MC), cis- and trans-1,2-dichloroethene (cis-DCE, trans-DCE), 1,1-dichloroethene (1,1-DCE), vinyl chloride (VC), 1,1-dichloroethane (DCA), chloromethane, 1,2-dichloroethane (1,2-DCA), dichloromethane, and chloroethane (CA). Sites which do not have these CVOC compound as the primary contaminant are eliminated.

## 3. Extent and Duration of Groundwater Monitoring

Ideally, this study would only use data from sites where no plume remediation activities have been implemented. This is because remediation activities have great impacts in altering plume behavior, which of course is their purpose. However, excluding these sites would severely limit the number of sites eligible for the study. On the other hand, there are many sites that do have several years of groundwater monitoring data prior to implementation of groundwater remediation activities. This study will draw sites from both of these categories using the following screening criteria:

- *Concentrations of one or more CVOCs of interest (e.g., PCE, TCE) have exceeded 10 ppb in a number of plume wells.*
- *A meaningful plume length (distance from source area to downgradient leading edge) may be defined.*
- *Data are available prior to active remediation measures. This refers to any engineered attempt to influence the contaminant plume in the aquifer (exclusive of source area remediation).*
- *The primary contaminant plume does not daylight into surface water bodies before the 10 ppb contour.*
- *The CVOC groundwater monitoring analytical data are available in electronic form.*
- *There are measurements of hydraulic conductivity, and of the (x,y) coordinates of the groundwater monitoring wells at the site.*

## 4. Site Hydrogeology

Advection is one of the key processes that influence plume behavior. Sites which have not measured either groundwater flow velocity directly or taken measurements of hydraulic gradient, and hydraulic conductivity such that a groundwater flow velocity can be estimated, are eliminated. The hydrostratigraphy of a site is also an important influence on plume behavior. Sites where boring logs and/or cross sections are not available are also eliminated. Optional information includes lithology and organic carbon classification of the site. This information will be used to ensure that a variety of lithologies and organic carbon conditions are represented.

5. **Identification and Magnitude of Source and Release(s)**

The location and characterization of the source are important for understanding how plumes behave. Sites where the approximate location of the source has not been identified are eliminated. Optional information regarding the nature of the source is requested so that the Initiative Data Collection Team can select sites that represent a variety of source conditions.

6. **Groundwater Chemistry and Contaminant Fate**

Groundwater analytical data on general minerals, biodegradation geochemical indicator compounds, and potential carbon sources are key to understanding natural attenuation processes that are dominant within a given hydrogeologic setting. However, these data have only been collected at a minority of sites. The Initiative Data Collection Team will be interested in sites where this data has been collected and/or studied.

7. **Plume Dimensions and Behavior**

This optional information regarding plume dimensions and behavior is requested so that the Initiative Data Collection Team can select plume sites that represent a variety of sizes. This study will attempt to draw sites representing the wide range of plume sizes that occur in the United States. For example CVOC plume lengths can vary over four-orders-of-magnitude, from 10's to 10,000's of feet in length.

8. **Remediation Activities**

This optional information regarding remediation activities is requested so that the Initiative Data Collection Team can select sites with the longest period of pre-groundwater remediation monitoring. In addition, many CVOC plumes have had primary source removal either by actual physical removal of a leaking tank, excavation of a disposal area, or by hydraulic control of the secondary source area, without necessarily exercising hydraulic control on the distal portion of the plume. These sites will not be excluded from the study.

9. **General Comments on Suitability of Site for Inclusion in Study**

This is a general question that allows personal comments that might not be obvious to the Initiative Data Collection Team. Since the person filling out the plume screening checklist is expected to be an individual with a good understanding of the site, they may have comments, opinions, or anecdotal information that could be helpful in the nomination and screening process.

10. **Data Requested in Electronic or paper Form**

This is a listing of the data that is being requested. It is preferred that as much of the data as possible be in electronic form. The most important data are the CVOC groundwater monitoring well analytical chemistry data, and the (x,y) coordinates for the monitoring wells. These data must be in electronic form. All other data are acceptable in electronic form.

## Chlorinated VOC Plume Screening Checklist

### Site Location, Points of Contact, and Reviewer

Site name: \_\_\_\_\_  
Alternate site names (aliases): \_\_\_\_\_  
City: \_\_\_\_\_  
State: \_\_\_\_\_  
Zip code: \_\_\_\_\_

Agency project manager: \_\_\_\_\_  
Agency name \_\_\_\_\_  
Street Address: \_\_\_\_\_  
City: \_\_\_\_\_  
State: \_\_\_\_\_  
Zip code: \_\_\_\_\_  
Phone number: \_\_\_\_\_  
Email (if available) \_\_\_\_\_

Person filling out this form: \_\_\_\_\_  
(if other than project manager)  
Associated agency: \_\_\_\_\_  
Street Address: \_\_\_\_\_  
City: \_\_\_\_\_  
State: \_\_\_\_\_  
Zip code: \_\_\_\_\_  
Phone number: \_\_\_\_\_  
Email (if available) \_\_\_\_\_

Consultant name: \_\_\_\_\_  
Company name: \_\_\_\_\_  
Street Address: \_\_\_\_\_  
City: \_\_\_\_\_  
State: \_\_\_\_\_  
Zip code: \_\_\_\_\_  
Phone number: \_\_\_\_\_  
Email (if available) \_\_\_\_\_

Responsible Party Contact: \_\_\_\_\_  
Company: \_\_\_\_\_  
Street Address: \_\_\_\_\_  
City: \_\_\_\_\_  
State: \_\_\_\_\_  
Zip code: \_\_\_\_\_  
Phone number: \_\_\_\_\_  
Email (if available) \_\_\_\_\_

Date this form completed: \_\_\_\_\_

## Key Screening Questions

Are the most significant chemicals of concern in groundwater at this site any of the following CVOCs:

yes no

carbon tetrachloride (CT), tetrachloroethene (PCE), trichloroethene (TCE) , or 1,1,1-trichloroethane (TCA), or their daughter CVOC products [(i.e., chloroform (CF), methylene chloride (MC), cis- and trans-1,2-dichloroethene (*cis*-DCE, *t*-DCE), 1,1-dichloroethene (1,1-DCE), vinyl chloride (VC), 1,1-dichloroethane (DCA), or chloroethane (CA)]?

- Have the concentrations of one or more CVOCs of interest (e.g., PCE, TCE) exceeded 10 ppb in a number of plume wells? yes no
- Can a meaningful plume length (distance from source area to downgradient leading edge) be defined? yes no
- Are data available prior to active remediation measures.? This refers to any engineered attempt to influence the contaminant plume in the aquifer (exclusive of source area remediation). yes no
- Is the CVOC groundwater monitoring analytical data available in electronic form? yes no
- Are the (x,y) coordinates of the groundwater monitoring wells known? yes no

*IF THE ANSWER TO ANY OF THE ABOVE QUESTIONS IS NO, DO NOT FILL OUT THE REMAINDER OF THIS FORM.*

## Electronic Data

The CVOC groundwater monitoring analytical data in electronic form is a minimum requirement. Please see page A-10 for a listing of requested paper and electronic data. The electronic data may be provided in any format that is convenient. The preferred formats are MS ACCESS tables or databases, Excel spreadsheets, tab-delimited text files, or MS Word documents, and any electronic version of site maps in AutoCAD (.DWG or .DXF) or ArcView/ArcINFO (.shp or .e00) formats. The data can be mailed on 3.5 inch PC-compatible disks, ZIP disks, or sent via internet by individual arrangement. Internet transmission is preferred.

Please list the content and format of the electronic data available for this site:

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## 1. Site History

### 1.1 Is a site description and contaminant release history available?

yes      no

## 2. Chemicals of Concern

**2.1. Insert an (X) in the following table to identify the chlorinated hydrocarbons that are *significant* constituent(s) of concern (COCs) and which are present in the groundwater.**

Check (X)	Chemical
	Carbon tetrachloride
	Chloroethane
	Chloroform
	Chloromethane
	Dichloroethane, 1,1-
	Dichloroethane, 1,2-
	Dichloroethylene, 1,1-
	Dichloroethylene, cis-1,2-
	Dichloroethylene, trans-1,2-
	Dichloromethane
	Methylene chloride*
	Tetrachloroethane, 1,1,2,2-
	Tetrachloroethylene
	Trichloroethane, 1,1,1-
	Trichloroethylene
	Vinyl chloride

\*Possible lab contaminant.

### 2.2. List of any other chemicals found at significant levels in groundwater:

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### 3. Extent and Duration of Groundwater Monitoring

#### 3.1. Number of monitoring wells associated with the plume

- a. within the affected water-bearing zone \_\_\_\_\_
- b. within overlying/underlying units \_\_\_\_\_

#### 3.2. Year monitoring began \_\_\_\_\_

#### 3.3. Have monitoring wells within the affected water-bearing zone(s) been generally sampled on a regular routine schedule? yes    no

#### 3.4. Total number of years monitoring wells have been sampled \_\_\_\_\_

#### 3.5. Has groundwater remediation commenced? yes    no

If yes:

Number of years monitoring wells were sampled prior to initiation of groundwater remediation: \_\_\_\_\_

Number of sampling events prior to initiation of groundwater remediation: \_\_\_\_\_

Number of years monitoring wells were sampled after groundwater remediation was discontinued: \_\_\_\_\_

Number of sampling events after groundwater remediation was discontinued: \_\_\_\_\_

#### 3.6. Has the plume been monitored or sampled with depth-discrete sampling methods? yes    no

### 4. Site Hydrogeology

#### 4.1. Are there multiple geologic units? yes    no

4.1.1. Provide a brief description of the site geology \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**4.2. Are there measurements of:**

hydraulic gradient?	yes	no
porosity?	yes	no
hydraulic conductivity in the plume?	yes	no

**4.3. Are there boring logs available?**

yes	no
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Are depth of hydrostratigraphic contacts at boring location available?

yes	no
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**4.4 Have the well elevations and locations been surveyed?**      yes      no

**5. Identification and Magnitude of Source and Release(s)**

**5.1. Have the source location(s) been approximately identified**      yes      no

**5.2. Are there multiple CVOC source areas?**      yes      no

5.2.1. If yes, do the primary CVOC plumes co-mingle?      yes      no

5.2.2. If yes, can their lengths be defined at the 10 ppb contour?      yes      no

**6. Groundwater Chemistry and Contaminant Fate:****6.1 Which of the following plume general minerals, biodegradation geochemical indicators compounds, and potential carbon sources were measured? (circle)**

Alkalinity	Iron, dissolved or Fe(II)
Ammonia	Manganese
Carbon dioxide (CO <sub>2</sub> )	Methane
Chloride	Nitrate/nitrite
Dissolved organic carbon	pH
Dissolved oxygen (O <sub>2</sub> )	Phosphate
Ethane	Redox potential (Eh or pE)
Ethene (ethylene)	Specific Conductivity (EC)
Fatty acids	Sulfate
Hydrogen (H <sub>2</sub> )	Sulfide
Other _____	Temperature

**6.2. Were any natural attenuation or biodegradation studies performed at the site?**

yes	no
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If yes, describe:

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## 7. Plume Dimensions and Behavior:

### 7.1. Has the CVOC groundwater contaminant plume been contoured?

yes no

### 7.2. Are there any indications of any special conditions that are affecting plume behavior, (e.g., structures such as sewer and water lines, or sumps)?

yes no

If yes, describe

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### 7.3. Is the primary CVOC plume daylighting into a river or lake, and truncating after the 10 ppb contour?

yes no

If yes, describe

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### 7.4. Are there pumping wells, which distort the plume, and interfere with natural plume behavior?

yes no

If yes, describe

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## 8. Remediation Activities

### 8.1 Have soil, groundwater, or vapor removal activities been performed in source area?

yes no

If yes, describe

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### 8.2 Have plume groundwater remediation activities been performed?

yes no

If yes, approximate date remediation began \_\_\_\_\_

If yes, approximate date remediation was discontinued \_\_\_\_\_

### 8.3 Short description of remediation activities (i.e., cycling, multiple methods, etc.)

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## 9. General Comments on Suitability of Site for Inclusion in Study

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## 10. Check if Available in Paper or Electronic Form {*electronic is preferred*}

### 10.1. Site Investigation Data

Paper	Elec.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Groundwater sample analytical data from each well through time (including CVOCs, minerals, etc.) { <i>electronic is required</i> }
<input type="checkbox"/>	<input type="checkbox"/>	Groundwater elevation & depth to groundwater measurements through time
<input type="checkbox"/>	<input type="checkbox"/>	Soil analytical data from borings or other samples
<input type="checkbox"/>	<input type="checkbox"/>	DNAPL/LNAPL analytical data
<input type="checkbox"/>	<input type="checkbox"/>	Soil & groundwater test data (porosity, bulk density, moisture, toc, etc.)
<input type="checkbox"/>	<input type="checkbox"/>	Aquifer pumping test results (i.e., transmissivity, conductivity)
<input type="checkbox"/>	<input type="checkbox"/>	Boring logs, x, y coordinates for wells, geologic description logs, depths of hydrostratigraphic contacts
<input type="checkbox"/>	<input type="checkbox"/>	Well construction logs (screen depths) (summary tables, if available)

### 10.2. Maps and Cross Sections

Paper	Elec.	
<input type="checkbox"/>	<input type="checkbox"/>	Regional site location map
<input type="checkbox"/>	<input type="checkbox"/>	Site maps showing physical features (topography, roads, sewerlines, drains)
<input type="checkbox"/>	<input type="checkbox"/>	Site maps showing monitoring well locations, and boring locations
<input type="checkbox"/>	<input type="checkbox"/>	Site maps showing source locations
<input type="checkbox"/>	<input type="checkbox"/>	Site maps showing groundwater elevation contours
<input type="checkbox"/>	<input type="checkbox"/>	Map of nearby wells and surface water bodies
<input type="checkbox"/>	<input type="checkbox"/>	Isocontour maps of COCs in groundwater
<input type="checkbox"/>	<input type="checkbox"/>	Isocontour maps of COCs in soil
<input type="checkbox"/>	<input type="checkbox"/>	Site maps showing locations of SVE wells & groundwater extraction wells
<input type="checkbox"/>	<input type="checkbox"/>	Geologic maps and cross-sections along and normal to axis of plume core

### 10.3 Narratives

- \_\_\_\_\_ Site Description
- \_\_\_\_\_ Site Geology
- \_\_\_\_\_ Release History
- \_\_\_\_\_ Site Investigations (summary, if available)
- \_\_\_\_\_ Remediation History

**\*Hard Copy Data:**

*Typically, an RI/FS will provide this information on site history, site description, and site characterization documents.*